

## Silver nanoparticle-coated "cyborg" microorganisms: Rapid assembly of polymer-stabilised nanoparticles on microbial cells

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### Abstract

© The Royal Society of Chemistry. Fabrication of "cyborg" cells (biological cells with surfaces functionalised using a variety of nanomaterials) has become a fascinating area in cell surface engineering. Here we report a simple procedure for fabrication of polycation-stabilised 50 nm silver nanoparticles and application of these nanoparticles for fabrication of viable "cyborg" microbial cells (yeast and bacteria). Cationic polymer-stabilised nanoparticles electrostatically adhere to microbial cells producing an even monolayer on the cell walls, as demonstrated using enhanced dark-field microscopy, atomic force microscopy and microelectrophoresis. Our procedure is exceptionally fast, being completed within 20 min after introduction of cells into nanoparticle aqueous suspensions. Polymer-stabilised silver nanoparticles are highly biocompatible, with viability rates reaching 97%. We utilised "cyborg" cells built using bacteria and silver nanoparticles to deliver nanoparticles into *C. elegans* microworms. We believe that the technique described here will find numerous applications in cell surface engineering. This journal is

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